National Institute of Environmental Health Sciences

Environmental performance of green building code and certification systems

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Abstract:

We examined the potential life-cycle environmental impact reduction of three green building code and certification (GBCC) systems: LEED, ASHRAE 189.1, and IgCC. A recently completed whole-building life cycle assessment (LCA) database of NIST was applied to a prototype building model specification by NREL. TRACI 2.0 of EPA was used for life cycle impact assessment (LCIA). The results showed that the baseline building model generates about 18 thousand metric tons CO2-equiv. of greenhouse gases (GHGs) and consumes 6 terajoule (TJ) of primary energy and 328 million liter of water over its life-cycle. Overall, GBCC-compliant building models generated 0% to 25% less environmental impacts than the baseline case (average 14% reduction). The largest reductions were associated with acidification (25%), human health - respiratory (24%), and global warming (GW) (22%), while no reductions were observed for ozone layer depletion (OD) and land use (LU). The performances of the three GBCC-compliant building models measured in life-cycle impact reduction were comparable. A sensitivity analysis showed that the comparative results were reasonably robust, although some results were relatively sensitive to the behavioral parameters, including employee transportation and purchased electricity during the occupancy phase (average sensitivity coefficients 0.26-0.29).

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Resource Description

Exposure :

weather or climate related pathway by which climate change affects health

Air Pollution, Ecosystem Changes, Food/Water Quality, Food/Water Security, Unspecified Exposure

Food/Water Quality: Other Water Quality Issue

Water Quality (other): Eutrophication; Acidification

Geographic Feature:

resource focuses on specific type of geography

None or Unspecified

Geographic Location:

resource focuses on specific location

United States

Health Impact: ☑

specification of health effect or disease related to climate change exposure

Cancer, Respiratory Effect

Mitigation/Adaptation: ☑

mitigation or adaptation strategy is a focus of resource

Mitigation

Resource Type: ☑

format or standard characteristic of resource

Policy/Opinion, Research Article, Research Article

Timescale: ☑

time period studied

Time Scale Unspecified

Vulnerability/Impact Assessment: ☑

resource focus on process of identifying, quantifying, and prioritizing vulnerabilities in a system

A focus of content